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MEDIA PROFILE

Grain gains with less water: Nuffield Scholar

Low rainfall is considered an impediment to grain production in Australia, but Nuffield Scholar Stuart Barden proposes that shortening the growing season in drier environments could improve water use efficiency (WUE) and maximise yield potential.

By Melissa Branagh-McConachy

Moving crop flowering and grain filling from spring to late winter in low rainfall areas would be the greatest advancement in grain production since zero-till farming, according to NSW grower Stuart Barden.

The prediction is based on the Nuffield Scholar's observations during a study tour through western Canada, Kenya and Tanzania, where low evaporation conditions similar to those of an Australian winter are producing significantly higher yields.

"These environments have gentle grain-filling temperatures and even in what Australians would consider to be seasons of low moisture availability, they are generating better results than we would expect from similar moisture levels," he says.

"Wheat harvested in mild conditions on the northern side of Mount Kenya produced a crop yield of 3.7 tonnes a hectare during the 2009 drought, which only delivered 170 millimetres of in-crop rainfall. It was similar in Alberta, Canada, where many wheat crops produced three to four tonnes a hectare on 150 to 170 millimetres of total available water last season. This highlights the tremendous benefits of low evaporation/cool finish environments."

In Australia, rising spring temperatures cause greatest harm to grain crops, but Mr Barden is confident that substantial yield improvements could be realised if frost risk is reduced or eliminated. "My travels convinced me that a 25 per cent yield gain in Australia's low rainfall zones is achievable," he says.

With 12,000 hectares of wheat and chickpeas under crop at properties in west Gilgandra, Warren and north-west Condobolin, the NSW farmer is well aware of the challenges facing grain producers in Australia's drier country. "We have had six years of tough growing conditions," he says.

Mr Barden was awarded a 2009 Nuffield Scholarship sponsored by the Grains Research and Development Corporation (GRDC) to explore practices in Kenya, Tanzania, Israel and Canada that could add value to grain production in Australia's low rainfall areas.

His study findings acknowledge that reducing the growing period is dependent on further scientific research to breed plants that can endure lower temperatures, and supercooling-type technology to ensure frost tolerance.

"The ability to plant fast spring wheats in late April/early May would generate an immediate 25 per cent yield gain in Australia's low rainfall zones, which would be revolutionary," he says. "Frost is our greatest obstacle."

Mr Barden investigated the potential to control plant cell freezing during his visit to the University of Saskatchewan in Canada, where scientists are using a number of techniques to produce plants with supercooling qualities.

"Research into developing frost resistance should be high on Australian grain growers' agenda," he says. "If we could be rid of the freeze problem, we could seize earlier sowing dates and move flowering forward 30 to 40 days, allowing the grain to fill during the softer period when we can avoid higher temperatures and maximise WUE."

Average rainfall across Mr Barden's NSW properties ranges from just 400 millimetres on red loam at Condobolin to 500 millimetres on Gilgandra's heavier grey soil, but he is adamant farmers must also "look at more than just millimetres if we want to take a step forward in rain-limited grain-growing systems".

"We need to start thinking about rainfall in terms of total moisture available, and confine our planting and fertilisation to between 20 and 30 per cent of the total area to boost WUE," he says. "The balance of the inter-row would be used as a water catchment, opening up the possibility for greater yields."

While maintaining 100 per cent residue cover is ideal, Mr Barden says residues created by cereal crops yielding less than 2.5 tonnes per hectare struggle to do their job when broadcast over an entire field. "You need residues to preserve moisture, but you also need moisture to produce residues."

Mr Barden says there is scope to use skip row configurations and zero-till/controlled-traffic operations in low rainfall zones to strategically direct crop residues onto plant line rows and channel run-off from non-productive areas to the row zones. He saw a similar tactic in the Negev Desert in Israel, where low rainfall (80 millimetres per annum) is supporting trees planted in micro-catchments.

"There are many issues to consider, for example evaporation is a major constraint, although with better crop residue management I believe we can minimise negative effects," Mr Barden says. "There needs to be a balance between biomass production, weed competition and the need for groundcover to reduce evaporation from the soil surface, which demands a systems approach.

"If we reduce the biomass, we can make more efficient use of the limited moisture and, hopefully, in future Australia will follow Canada's lead and breed lower biomass varieties capable of returning better yields." Mr Barden says research carried out in Western Australia has also demonstrated the possibilities of using wider rows with various plant densities.

The Nuffield Scholar supports this philosophy and is managing biomass on his own properties by reducing the plant population (planting rates have dropped from the district average of 35 kilograms per hectare to about 25 kilograms per hectare with the exception of crops sown on the heavier soil) and widening the rows to 375 millimetres. He also employs no-till and controlled traffic management.

"We have experienced a 10 per cent yield gain since implementing these management practices three years ago, and if we could plant earlier using supercooling-type technology I believe we could potentially raise that by another 25 per cent," he says.

For more information contact Stuart Barden, phone 02 68479267, email stuartbarden@bigpond.com

A high-resolution photograph of Mr Barden can be downloaded from www.coretext.com.au/communications_images.php. Please contact Catherine Norwood at Coretext Communications (03) 9670 1168, cnorwood@coretext.com.au if you have any problems accessing images.

Caption: Nuffield Scholar Stuart Barden says Australian grain growers in low rainfall zones could achieve 25 per cent yield gains by sowing earlier and using supercooling-type technology to ensure frost tolerance.

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